WOMEN AND RENEWABLE ENERGY: ENSURING CLIMATE RESILIENCE IN GHANA THROUGH INCLUSIVE AND PARTICIPATORY PROCESSES

BY

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A DISSERTATION SUBMITTED TO THE UNIVERSITY OF MEDIA, ARTS AND COMMUNICATION UNIMAC-GIJ IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF MA IN DEVELOPMENT COMMUNICATION.

NOVEMBER 2024

DECLARATION BY STUDENT – DISSERTATION

I hereby declare that this research is a result of my intellectual property under supervision and that to the best of my knowledge, it does not involve any material or work published by other persons nor received and accepted for the award of any other degree of the university, except where duly cited and referenced in the text.

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This dissertation has been prepared and presented under my supervision according to the guidelines for supervision and formatting of research laid down by the Institute of Journalism under the University of Media, Arts and Communication (UniMAC-IJ)

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Supervisor	**Signature**	**Date**

DEDICATION

This dissertation is dedicated firstly to the Almighty God for his marvellous grace in all things, throughout this master's programme. Also, for the unflinching support, unremitting efforts, love and immense contribution received through my academic journey, I dedicate this research to my family.

ACKNOWLEDGEMENTS

It is very usual for people to assume that a researcher is the sole architect of his or her research. But I can boldly say that many individuals, acknowledged herein or not, worked behind the scenes and pointed me in useful directions, helping in practical ways to achieve the good work done.

I am appreciative of my supervisor, Dr. Lawrencia Agyepong, for her dedicated attention, constructive scrutiny and suggestions throughout this study. I am equally thankful for the support of the staff of the Green Africa Youth Organization (GAYO) and 350 Ghana Reducing Our Carbon (350G-ROC) in the study. I acknowledge you for your immense support.

I would also like to sincerely thank Dr. Collins Adu Bempah Brobbey, Dr. Daniel Odoom, Dr Joseph Obeng-Baah and Dr. Stanley Semarco for their invaluable insights and support. Their collective wisdom and encouragement have played a significant role in shaping the foundation of this academic endeavour.

TABLE OF CONTENTS

LIST OF TABLES

ABSTRACT

The renewable energy transition presents an important opportunity to combat climate change while also promoting socioeconomic development, particularly in developing countries such as Ghana. Despite global advances in the adoption of renewable energy, gender gaps remain, particularly as regards women's participation in technical and decision-making roles within the sector. This research examines the role of women in renewable energy adoption in Ghana and how increasing their involvement through participatory processes might improve climate resilience. Drawing on current research, the study identifies critical barriers to women's participation, such as socio-cultural norms, low technical education, and insufficient access to resources. The study assesses the current state of renewable energy in Ghana, investigates the influence of inclusive and participatory processes, and presents recommendations for building climate resilience by addressing gender disparities. By highlighting these issues, the study aims to emphasise how women inclusivity can advance Ghana's renewable energy transition efforts toward building a climate resilient economy.

CHAPTER ONE

INTRODUCTION

1.0 Background of Study

Globally, modernization, advancement in technology and innovation have directly or indirectly impacted the transition of energy exploitation to more sustainable options, thus renewable energy (Żuk & Żuk 2022). The growing trend in renewable energy continues to create a lot of career-based opportunities for many organizations and individuals, regardless of their gender (International Renewable Energy Agency, 2020). This opportunity for gender diversity in energy transition is a recipe for a climate-resilient economy (Konadu et al., 2022) based on the perspective that the female gender tends to have a relationship with energy in one way or another (Cecelski, 2002).

For over two decades ago, the female gender experienced under-representation in many Science, Technology, Engineering and Mathematics (STEM) related fields concerning career choice, particularly the energy sector (Feenstra, 2002). Currently, the narrative has changed to an appreciable extent due to the growing awareness of the role of women in climate action and the transition to more sustainable forms of energy. That notwithstanding, the gap in the representation of women relative to men has been observed to require more closure (Feenstra, 2020). The International Renewable Energy in 2019 carried out a study associated with the subject, and the outcome suggested that on a global scale, 45% of women were found in administrative positions in the renewable energy sector, while only 28% were directly involved in technical aspects of the sector or on the field.

According to Czako (2020), this limitation could be traced to the low number of females in Science Technology Engineering and Mathematics education (STEM). In a research, Standal et al., (2020) discovered other determining factors such as cultural, societal, and perception of

self-incapacitation, among others. Despite the stated, limited literature exists as to the peculiar challenges faced by women in the energy transition situation in the Ghanaian setting. This is what drives the motivation for the current study, considering the urgency to boost the economy of the nation through renewable energy production and the pivotal role of women in this regard (Cecelski, 2000).

1.1 Statement of the Problem

Climate change poses significant threats to the socio-economic development of developing countries, with Ghana being particularly vulnerable (Ghana National Climate Change Policy, 2013). Women, who make up the majority of Ghana's population, are the most affected as a result of their dependence on natural resources for their livelihoods, coupled with other factors such as limited access to financial and technological resources (United Nations Development Programme, 2020).

In a recent research by Azeem et al., (2023), a direct relationship between gender inequality, financial instability and economic resilience has been revealed. Countries with high poverty rates often exhibit higher levels of gender inequality, with women being the victims.

Just like any other developing country, the average 21st Century Ghanaian woman is daily burdened with the simultaneous responsibilities of engaging in income-fetching activities to support the family and engaging in majority of the unpaid domestic work (United Agency for International Development, 2010). This in the long run limits their zeal and ability to invest in building their skills, pursuing higher studies and training particularly in technical fields (Baruah, 2017). This among other indicators has caused many women to divert to the health and the social sciences relative to the engineering-based sectors (Baruah, 2017).

Renewable energy thus presents an opportunity to mitigate the impacts of climate change and foster climate resilience. A search through existing literature brings to light different forms of research with emphasis on uses of renewable energy in developing countries, especially household energy and its impact on the female gender (Räty & Carlsson-Kanyama, 2010).

A study by United Nations Women (2021) shows that giving women the opportunity to participate in renewable energy initiatives results in a more equitable distribution of energy benefits, as well as an improvement in household energy management. In a related research conducted by Clancy et al., (2017), women's involvement in decision-making on energy-related issues was found to yield an improved project sustainability and an enhanced community acceptance of renewable energy. Many such studies have been carried out in different countries such as India and Kenya to investigate the inclusivity and participation of women in renewable energy projects. In all these, it was discovered that women were empowered, and community resilience was enhanced when they were involved (Abdullah & Jeanty, 2011).

According to the Energy Commission of Ghana in 2021, although Ghana has adopted renewable energy technologies as part of the strategies geared towards promoting sustainable development, there exists a huge gap with regard to the participation of women in the renewable energy sector. International Renewable Energy Agency (2019) has identified gender disparities in access to energy, finance and decision-making as the primary indicators of limited participation of women in renewable energy projects. Gil (2018) also identified low levels of education, lack of technical skills, and sociocultural norms as the factors that hinder the effective participation of rural women in renewable energy projects. These women are the most vulnerable as they are the most likely to be threatened by food insecurity, drought, poor health, among others as a result of the adverse effects of climate change (United Nations Development Programme, 2020).

Globally, women who make up the work force of the renewable energy sector constitute only 32%, and the figure is far lower in Ghana (Energy Commission of Ghana, 2021). This is clear evidence of the constraints faced by women in participating and advancing careers in the field of renewable energy. In essence, although Ghana has embraced renewable energy, the inclusivity and participation of women is below the belt.

Given these challenges, this study aims to investigate the role of women in renewable energy adoption in Ghana and explore how their increased involvement and participation could contribute to enhancing climate resilience. By addressing the gender gap in the renewable energy sector, Ghana has the potential to not only advance its climate resilience goals but also promote gender equality and economic empowerment.

1.2 Aim of the Study

The aim of this study is to examine the impact of inclusive and participatory processes on women's participation in renewable energy transition in Ghana.

1.3 Objectives of the Study

In order to achieve the main aim of the study, the following specific objectives have been set;

1. To assess the current state of renewable energy in Ghana
2. To analyse the role of women in the renewable energy transition in Ghana.
3. To identify the barriers that limit women's inclusivity and participation in the energy transition in Ghana
4. To evaluate women's inclusive and participatory processes that result in climate resilience in Ghana

1.4 Research Questions

1. What is the current state of renewable energy in Ghana?
2. What is the role of women in the renewable energy transition in Ghana?
3. Which barriers limit women's inclusivity and participation in the energy transition in Ghana?
4. What inclusive and participatory processes involving women are most effective in promoting climate resilience through renewable energy adoption in Ghana

1.5 Research Hypothesis

1.5.1 Hypothesis for Research Question 1:

Null Hypothesis: The current state of renewable energy in Ghana does not significantly contribute to sustainable development and climate resilience.

Alternative Hypothesis: The current state of renewable energy in Ghana significantly contributes to sustainable development and climate resilience.

1.5.2 Hypothesis for Research Question 2:

Null Hypothesis: Women do not play a significant role in the renewable energy transition in Ghana.

Alternative Hypothesis: Women play a significant role in the renewable energy transition in Ghana.

1.5.3 Hypothesis for Research Question 3:

Null Hypothesis: Barriers do not significantly limit women's inclusivity and participation in the energy transition in Ghana.

Alternative Hypothesis: Barriers significantly limit women's inclusivity and participation in the energy transition in Ghana.

1.5.4 Hypothesis for Research Question 4:

Null Hypothesis: Inclusive and participatory processes involving women are not effective in promoting climate resilience through renewable energy adoption in Ghana.

Alternative Hypothesis: Inclusive and participatory processes involving women are effective in promoting climate resilience through renewable energy adoption in Ghana.

1.6 Significance of the Study

This study has the potential to contribute to existing data related to the subject matter, which would be used as reference material for further studies. Results from this study may be useful to stakeholders responsible for instituting related policies, as a source of reference. Also, the outcome of this research would serve as an eye-opener thus contributing to awareness creation on the instrumental role of women in the energy transition, necessary for developing a climate-resilient Ghanaian economy. This would therefore serve as a useful tool to also boost the number of girls who enrol in STEM-related programs, as well as women who venture into STEM-related career paths.

Last but not least, the outcome of this study would be instrumental in equipping mentors and counsellors to effectively guide females in making career choices.

1.7 Organisation of the Study

The study will be organized into five chapters. The chapter one presents the background of the study, the problem statement, the research objectives, questions and hypotheses, significance of the study, summary of the methodology and the organization of the study. The second chapter of the study presents the literature review where relevant topics and issues related to the study are reviewed and presented. The chapter three gives a detailing of the research methodology that would be adopted in carrying out the study. It emphasizes the research design, the population of the study, sampling and sample size determination, source of data, data collection instrument, data analysis and the ethical consideration. The fourth chapter presents the analysis of the data and discussion of the results. The results of the data and the discussion will be presented under the various objectives. The final chapter presents the summary of study, key findings conclusion, limitations of the study, suggestions for future research, and recommendations of the study

1.8 Chapter Summary

This chapter provided a context for the study. It also presented a research problem, research aim and objectives, research hypotheses, and significance of the research, as well as a detailing of how the research is organised.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter provides a general exposition of the energy threat on a global scale, the concept of renewable energy, its impacts on the individuals and families involved, and the society at large. The review also highlights renewable energy sources and the current state of renewable energy in Ghana. It provides an outlook on the role of women in renewable energy while providing examples of cases where women's contributions have impacted the renewable energy sector. The chapter also reviews some barriers to women's participation in the renewable energy sector, as well as inclusivity and participatory processes. The review concludes with a theoretical framework using the participatory communication theory and its relevance to the study.

2.1 The Global Energy Threat

In the world today, sustainable development has been endorsed by environmentalists, economists, industrialists, politicians, and even theologians as the guiding principle for policy making at the local, national and international level (Jacobs, 1999).

Sustainable development has to do with the decision to harness all available resources, including energy resources at a country's disposal for development purposes, while putting in place strategies to ensure the availability of the same resources for future generations (Nyasapoh et al., 2022). In essence, sustainable development hinges on the holistic improvement of the quality of community life with the preservation of ecological processes (United Nations, 2015). With respect to the utility of energy resources for sustainable development, renewable energy sources have been noted to be a better choice as compared to

fossil and nuclear energy, on the scales of environmental significance and long- term viability (Tiwari & Mishra, 2011).

The exploitation of fossil fuel as the primary source of energy could be linked to the exponential rate of human population growth coupled with the growing energy needs for lighting, heating, communications, computers, industrial equipment, transport, and many more (International Energy Agency, 2014). Existing data suggests that in the 20th century, the use of fossil energy from coal, oil and gas and its nuclear energy counterpart shot up by ten times the previous rate globally. This global issue of the exploitation of non-renewable energy got worsened in the 21st century as a result of the increased levels of industrialization across nations and growing energy demands by previously less developed economies (Ayoo, 2000).

The emergent effects experienced by the over-reliance on these energy sources has been the depletion of fossil fuel reserves, increased Green House Gas emissions and its associated climate change, persistent and unresolved conflicts in the geopolitical and military space, and the high level of instability with regards to the fluctuations in prices of fuel worldwide (Vakulchuk et al., 2020). There is the possibility of irreversible threats that the stated effects could pose to nations across the globe (United Nations Framework Convention on Climate Change, 2015), if efforts are not made to transition to renewable energy resource use. Literature shows that energy consumption is directly related to increasing development. In the face of the climate crisis, nations are moving towards decarbonized energy sectors to shift towards a global zero-carbon society. Since populations within low-to-middle income (LMI) nations are projected to grow and industrialize the greatest amount in the next decade by 2030, it is important to explore non-fossil fuel options that will support these populations and economies to transition to clean, low-carbon societies. Obviously, renewable energy is integral in the global fight against climate change to decarbonize the energy sector (Singh et al., 2019)

2.2 Renewable Energy

In the quest to promote the use of renewable energy for sustainable development, Tester (2005) defined the term sustainable energy as, "a dynamic harmony between the equitable availability of energy-intensive goods and services to all people and preservation of the earth for future generations. According to Ellaban et al., (2014), renewable energy is that which is gotten from renewable sources such as sunlight, wind, rain, tides, waves and geothermal heat, and has the potential to be replenished naturally with time.

Based on the above definition, renewable energy sources could be categorized into hydropower, solar energy, bioenergy, wind energy, geothermal energy, and energy from tides and waves of the ocean. The over-arching advantage renewable energy has over non-renewable sources is that they have the natural ability to replenish their sources, hence these sources cannot be depleted in any way by any mean possible. In addition to the stated, renewable energy sources have the potential to reduce emission of greenhouse gases to a significant extent. They are sustainable in nature and pose no known threat to food security, biodiversity and the holistic quality of life of the human population and societies (Twidell & Weir, 2015).

The strive to attain the Millenium Development Goals has seen an increased discussion around the need for an efficient generation and utility of energy, hence renewable energy (United Nations Conference on Sustainable Development, 2012). Many countries have thus experienced a gradual transition to renewable energy as an alternative to fossil fuels. Statistics has suggested that in the year 2012, 22% of the total energy generated worldwide was harnessed from renewable energy sources (United States Energy Information Administration, 2012).

2.3 Sources of Renewable Energy

2.3.1 Hydropower

Hydropower is one of the primary renewable energy sources harnessed from water moving from a higher to a lower altitude. The mechanism of this movement turns turbines, resulting in the production of electricity. The generation of energy through hydropower requires the building of dams with reservoirs, run-off-river and in-stream projects (Jackson, 1993).

2.3.2 Wind Energy

Wind energy is the leading renewable energy source in the world, according to Manwell et al., (2010). Wind energy makes use of kinetic energy from moving air depending on its density, to generate electricity on a large scale from large turbines (Asumadu-Sarkodie & Owusu, 2016; Edenhofer et al., 2011).

2.3.3 Ocean Energy

A huge amount of energy from the ocean in the form of waves, tides, currents and heat has the capacity to meet the energy demand of the whole world (Jacobson & Delucchi, 2011).

2.3.4 Geothermal Energy

This form of renewable energy is naturally harnessed in the form of heat from the earth's core Jackson (1993). The origin of the heat is linked with the internal structure of the planet and the physical processes occurring there. Once drawn to the surface, fluids of various temperatures can be used to generate electricity and other purposes that require the use of heat energy" (Edenhofer et al., 2011).

2.4 An Overview of the Current State of Renewable Energy in Ghana

Ghana is highly endowed with a plethora of renewable energy resources including bioenergy, hydropower, solar energy and wind energy. However, Ghana is faced with several challenges in capitalizing on these resources to provide reliable and sustainable energy supply. The main reason why like many other African nations, power generation issues for the masses continue to remain a chronic challenge lies in their low level of harnessing (Bugaje 2006). Ghana depends heavily on hydropower for energy supply and this makes the country vulnerable to alterations in water availability caused by climate change, impacting the production reliability of energy (Amponsah et al., 2014). Solar energy is another source of energy that has some potential due to high levels of solar irradiance, averaging 4.5 to 5.6 kWh/m²/day. Despite the traction gained by solar projects in Ghana, their full potential has not been realized as a result of high initial costs, limited technical know-how or capacity and inadequate incentives (Ackah et al., 2014). Wind energy which is also viable in the coastal areas of the country remains largely unexplored. Implementation of bioenergy including agricultural residues as well as biomass which also have the potential to serve as sustainable energy sources has so far been limited to small-scall projects (Kemausuor et al., 2011).

The policy framework of Ghana's renewable energy sector has been progressive with the passage of the Renewable Energy Act 2011 which established a renewable energy fund, fiscal incentives and Ghana's National Energy Transition Framework 2022-2070 which aims to decarbonize the energy sector and achieve net-zero emissions by 2070 while ensuring socioeconomic growth and the use of the country's natural energy sources. However, these policies have encountered challenges in implementation, including fragmented institutional coordination, insufficient funding, and lack of enforcement (Energy Commission of Ghana, 2019). The agencies of government have grappled to create a cohesive policy arena which has decelerated the growth of the renewable energy sector and impacted private sector investment

opportunities (Nyarko et al., 2018). While it offers significant long-term benefits, renewable energy projects require substantial initial capital with little affordable financing options, thus making financing a critical barrier to renewable energy development in Ghana. Despite these challenges, the government of Ghana is committed to transition with a target to increase renewable energy's share in the national energy mix top 10% by 20230.

The following are highlights of the forms of renewable energy being harnessed in Ghana:

2.4.1 Hydropower

Hydropower has long been the primary source of electricity in Ghana throughout the past years of independence till date, as generated through the building of the Akosombo Dam and the Kpong and Bui hydroplants. These facilities produce approximately 1,580MW to the national grid with the Akosombo Dam accounting for about making it the largest contributor to Ghana's energy mix (Khalil, 2015). Despite the availability of these resources, the country's major reliance on hydropower has resulted in power supply challenges stemming from climate variations, particularly, the changes in rainfall patterns, impacting water levels and consequently, electricity generation (Amponsah et al., 2014). As of 2015, virgin sites which were potential sources of hydropower had been discovered, numbering up to 22 small and 17 medium sized locations. In all, the expected total capacity was 800MW (Khalil, 2015). These additional sites located in regions with untapped river systems even when fully developed would be insufficient to meet the country's energy demands which continues to outpace supply due to its growing population and expansion of the industrial sector (Energy Commission of Ghana, 2019). This inadequacy of hydropower has resulted in recurrent power crisis, locally known as "dumsor", along with prolonged load-shedding. Consequently, solar energy was considered as a supplement to the hydroelectricity being generated, as a means to reduce the frequency of the load shedding and to promote renewable energy (Kemausuor et al., 2011).

2.4.2 Solar Energy

To remedy the country's power crisis, policymakers have focused on expanding Ghana's solar energy capacity. The government, recognizing solar energy's potential to supplement Ghana's energy mix, instituted various strategies geared towards increasing the capacity of renewable energy generated by up to 10% of the national energy supply by the year 2030. Notable among the strategies was the boosting of solar energy generation by up to 35 exajoules (Eshun & Amoako-Tuffour 2016). The idea to complement the amount of electricity generated nationwide by 6 per cent, led to the construction of a 155-MW solar plant in Nzema in the Western region of Ghana. As one of the largest solar installations in Africa, this project which was commenced in 2016 was designed to serve over than 100,000 households. The Nzema solar plant demonstrates the country's progress in addressing its energy supply challenges by exploring high solar potential with an average between 4.5 and 5.6 kWh/m² per day (Kemausuor et al., 2011). The Ghana Energy Commission also embarked on a nationwide project geared towards minimizing the daily national peak load by 200MW by installing solar panels on the rooftops of buildings including residential, commercial and industrial facilities. This initiative, known as the National Rooftop Solar Program was complemented by government incentives such as subsidies and rebates to encourage solar adoption among consumers (Energy Commission of Ghana, 2019). These efforts to deploy solar energy have been met with several barriers including the initial high cost of solar technology, limited access to financing, and infrastructure deficiencies remain significant obstacles (Adaramola et al., 2017). Although the Renewable Energy Act of 2011 provides a legal framework for renewable energy development, more targeted incentives and financing mechanisms are needed to scale up solar power, particularly for off-grid rural communities where electricity access remains limited (Agyekum, 2020). Another challenge has been the storage of this intermittent energy resource. Solar energy requires effective storage solutions to ensure a steady supply, especially

during peak demand periods or in the absence of sunlight. However, Ghana's efforts to integrate energy storage are still in the early stages, and additional investment in battery storage and grid modernization is necessary to fully leverage the benefits of solar energy (Khalil, 2015).

It was estimated that by the year 2030, at least a total of 10 percent of electricity produced should be from renewable sources. In addition to the stated, thermal energy generation was to be boosted to meet 20 percent of the national target.

2.4.3 Bioenergy

Capitalizing on its agricultural resources and waste byproducts, Ghana has a high potential for bioenergy production. The country could become a major producer of biofuels, particularly, biodiesel from the cultivation of energy crops such as oil palm fruit and jatropha (Duku et al., 2011). Biomass co-generation plants, which use sawmill residue and oil palm waste, have a total capacity of over 6 MW (Duku et al. 2011). This presents an opportunity to upscale bioenergy production to increase energy security and contribute to the country's energy mix. Although it has the potential to produce both electricity and fuel with minimal risks, bioenergy in Ghana remains untapped mainly due to insufficient infrastructure, limited investment, and the absence of supportive policies for scaling up production (Ladanai & Vinterback, 2009).

2.5 The Role of Women in the Energy Transition in Ghana.

It has been over thirty years since the publishing of the work on the role of women in development by Boserup (1970). In recent times, there has been an awakening in the space of researchers and experts concerning incorporating gender-related perspectives in their work on the grounds of efficiency and social equity, as ignited by the Beijing Conference on Women in 1995 (International Renewable Energy Agency, 2019). Despite this revolution, countless

numbers of developmental projects are established without the integration of their impacts on women or the inclusion of women in their implementation. This includes the story of renewable energy related projects. Quite on the contrary, some researchers argue that there has been good documentation on the participation of women in the rolling out of renewable energy projects (Cecelski, 1992; Agarwal,1986). In order to ensure the sustainability of the renewable energy drive, the relevance of women's participation in renewable energy transition cannot be overlooked and (Clancy, 2019).

2.5.1 Women in Biomass Energy

The primary source of energy for cooking in many households around the globe is biomass energy. The United Nations Development Programme (1997) suggests that a little over two billion people from different parts of the world rely on the fuel derived from biomass to meet most of their basic energy needs. In many underdeveloped and developing countries, the level of household consumption of biomass fuel is 80%. It is interesting to note that women, in most cases rural women and their children, are at the forefront in the use of biomass energy (Dida, 2022). Owing to the fact that women are mainly responsible for cooking and running the home effectively, they make their own biofuels in their homes for cooking. In addition to that, they champion the course of sustainable living by preserving and protecting various kinds of forestry products (Food and Agriculture Organisation, 1987). According to Intermediate Technology Development Group (1992), and the International Labour Organisation (1987). The expertise of women in the area of best practices towards fuel savings, efficient fire management, merits and demerits of an array of diverse fuels and stoves, the mechanism behind how different types of fuels undergo combustion, among others, is phenomenal (Hooper et. al., 2018).

2.5.2 Women in Renewable Energy Technologies

The designing of renewable energy products as a collaborative work between the manufacturer and the end user produces far better outcomes in terms of product acceptance by the populace (Yang et al., 2021). Since time immemorial till date, the input of women in the designing and modification of household energy technologies and projects, stemming from their roles as primary household energy managers in many cultures, has remained relevant (Cecelski & Boulevard, 2000). A vivid example is the fact that women have shown their ability to provide useful input to improved stove design, in an urban stove project in Addis Ababa, Ethiopia (Bersisa et al., 2021). Another example is the solar cooker test project in South Africa where a survey was carried out with women being the respondents, on the performance of various solar cooker models and their preferences (Wentzel & Pouris, 2007).

Women's contribution in renewable energy development goes beyond design to influence policy-making, project implementation, and community engagement. For instance, in Ghana, women have been involved in initiatives such as solar panel installations and biogas projects, which have directly contributed to improving energy access and enhancing livelihoods in off-grid areas (Mensah et al., 2016). Similarly, women in rural areas of India have actively participated in the distribution of solar lamps, acting as both users and distributors. This has empowered them economically and socially while addressing energy poverty within their communities (Khandelwal et al., 2017).

2.5.3 Women in Renewable Energy Micro Entrepreneurship

Women are increasingly taking up micro-entrepreneurial initiatives in renewable energy, especially in areas where access to traditional energy sources is limited. According to Reddy (1996), women are the best renewable energy entrepreneurs for both household and small-scale

industry needs. With the requisite technical training and support, women have been able to venture int the field of engineering and have been able to contribute to the revolution of inventing renewable energy technologies and creating businesses out of that in order to generate financial benefits. Examples include the innovation of solar dryers for food preservation (Okalebo & Hankins, 1997), production of solar ovens for commercial purposes (Stone, 1998), and the making of stoves for sale (Intermediate Technology Development Group, 1998). In sub-Saharan Africa, women-led solar lamp enterprises have increased access to inexpensive, clean lighting, allowing children to continue their education after dark and stimulating local economies (Rao et al., 2019). Furthermore, by developing decentralised energy solutions that lessen reliance on national grids and offer reliable electricity in off-grid locations, women's microbusinesses in the renewable energy sector have promoted community resilience (Clancy & Feenstra, 2019).

2.6 Barriers that Limit Women's Inclusivity and Participation in the Energy Transition in Ghana

According to the International Renewable Energy Agency (2019), several factors contribute to women not advancing in the area of their inclusivity and participation in the renewable energy transition in Ghana. Among these were low self-perception, the lack of or low level of awareness of the opportunities that exist in the field, unfavourable or rigid workplace policies, relatively fewer women pursuing science, technology, engineering and mathematics (STEM) related programmes to a higher level, lack of support for family responsibilities and childcare, lack of, or inadequate training opportunities, and many others (International Renewable Energy Agency, 2019).

Baruah (2017) also highlights the absence of appropriately targeted training, education, apprenticeships, employment placement, financial tools and supportive social policies, transitioning to renewables may exacerbate existing gender inequities and hinder human development goals.

2.7 Climate Resilience in Ghana

According to Khan (2024), climate resilience is a composition of the collective proactive strategies taken by communities to mitigate, or recover from the impacts of, and adapt to climate change. Khan (2024) opines that in order to enhance climate resilience, renewable energy renewable energy could be integrated in building strong, autonomous systems with the view of protecting communities against the impacts of climate change. He argues that making renewable energy sources available and accessible reduces dependence on severe weather and other disruptions that have the potential to adversely affect the traditional electrical grid. For example, the use of solar microgrids can power homes, schools and hospitals, thus improving quality of life and promoting more effective responses to climate-related events. Another resilience strategy proposed by Khan (2024) is the use of renewable energy technologies to solve the increasing water crises in many parts of the world due to climate change.

As part of Ghana's resilience strategies against climate change, the Global Centre on Adaptation (2022) published the comprehensive roadmap developed to enhance the resilience of Ghana's infrastructural systems. Components of this roadmap include the identification of key infrastructural risks such as the forecasted road and highway damages worth 3.9 billion by 2050 due to flooding. Another component includes the vulnerability of energy systems and water supply infrastructure, such as the flood prone Weija Dam which supplies 80% of Accra's drinkable water. This initiative was made possible by the Ministry of Environment, Science,

Technology, and Innovation (MESTI) in partnership with the Global Center on Adaptation (GCA) and other international stakeholders.

In a study, Obeng et al. (2011) evaluated the policy landscape in Ghana and emphasized the relevance of stronger institutional frameworks in the implementation of renewable energy deployment initiatives. The need for policies that consider the resilience of energy systems to climate impacts, particularly for rural electrification was also highlighted in the study.

According to Mensah et al. (2014) in a study on the subject of increasing climate resilience, improving energy efficiency in buildings and appliances has the potential to decrease the load on Ghana's traditional energy grid, making it more resilient to the variability in renewable energy supply caused by climate factors.

Currently, the primary source of Ghana's energy for electrification is hydropower, which consistently experiences disruptions in energy supply due to the impact of climate change (Kemausuor et al., 2011). Ayensu (2012) emphasized the importance of using climate models to predict the impacts of climate change on hydropower generation in his research. According to Ayensu (2012), the use of climate models allows for better management of water resources and adaptation of energy systems to changing climate conditions.

Another approach geared towards increasing climate resilience according to the GCA is the utilization of renewable energy solutions, an example being the Scaling Renewable Energy Mini-Grid and Net Metering Program. Through this initiative spearheaded by the African Development Bank (AfDB), risk assessments are conducted to safeguard the energy infrastructure against potential future climate hazards (GCA, 2022; AfDB, 2022).

In research carried out to explore decentralization of energy systems, Brew-Hammond (2010) highlighted the potential of decentralized renewable energy systems in providing stable power to communities that are victims of energy fluctuations due to the impact of climate change.

Kemausuor et al. (2011) highlighted the potential of solar and wind energy, particularly in the northern regions, where climate impacts are severe.

On the issue of enhancing the efficiency and resilience of solar panels against extreme climatic conditions, particularly in the Sahelian regions, Kintampo et al. (2015) proposed the use of robust materials and the need for regular maintenance.

The publication by the Global Center on Adaptation (GCA) also highlighted Ghana's climate resilience strategy aimed at pioneering more localized and effective climate adaptation projects. This is achieved by enhancing access to climate finance through global platforms such as the Green Climate Fund (GCF) and strengthening national institutions such as the Ghana Infrastructure Investment Fund (GIIF) to become Direct Access Entities to the GCF (Global Center on Adaptation, 2022).

2.8 Inclusivity and Participatory Processes

According to (International Renewable Energy Agency, 2019), it is imperative for policy makers to invest in skills training programs that provide females the opportunity to acquire a plethora of skills from the technical domain such as installation, operation, and maintenance. To ensure a holistic form of training, business and other non-energy related skills could be incorporated as part of the training package. Examples include but are not limited to accounting, bookkeeping, product design and pricing, and business plan design, leadership training and digital literacy (Clancy & Feenstra, 2019).

In promoting gender inclusivity and participation in the renewable energy transition in Ghana, an economic framework which includes human energy and health externalities should be put in place in order to facilitate the contribution of women in the renewable energy sector (Baruah, 2017).

Also, the publishing of projects involving women in renewable energy should be boosted in order to create awareness and a platform for education and training of more women. This would drive the implementation of gender related policies for women in the renewable energy field.

The disaggregation of data by gender should be standard practice in all renewable projects offering immediate insights to those directly involved in implementation, and also in monitoring of impacts and benefits (Baruah, 2015).

It is estimated that the poorest people in our country are children and women. In policy decisions, gender equity must be upheld and made an integral aspect of the drive towards minimizing the rate of gender inequality and poverty, and to boost the access to renewable energy transition (Pearl-Martinez & Stephens, 2016).

2.9 Theoretical Framework

This section discusses the theory on which the research is conducted. The research is based on the theoretical underpinning of the Participatory Development Communication Theory, also known as a dialogical pedagogy, developed by Paulo Freire in 1970.

2.9.1 Participatory Development Communication Theory

Participatory development communication is the use of mass and traditional media as well as interpersonal means of communication that capacitates communities to aspire and discover solutions to their development issues and problems. It has also been defined by Kheerajit and Flor (2013) as a key of uniting stakeholders for the purpose of cooperation to address environmental problems and work toward achieving sustainable social change away from individual behaviour change.

One major approach to participatory communication is the dialogical pedagogy of Paulo Freire, which has been widespread accepted as a normative theory of participatory communication (Servaes & Malikhao, 2005). Paulo's pedagogy emphasizes dialogue or two-way communication as a way of ensuring consensus for sustainable action in development activities. It highlights respect for the autonomous personhood of each human being and demands respect for otherness, with reference to another human being. Freire also stresses in this pedagogy that there is no solution to general situations of poverty and cultural subjugation in individual opportunities and as such calls for a collective action (Servaes & Malikhao, 2005).

A problem with this approach is that it focuses on group dialogue instead of amplifying media as radio, print and television. Paulo Freire in this theory also gives little attention to the language or form of communication, as most of argument was focused on the intentions of communication actions.

2.9.2 Relevance of the Theory to the Study

This theory provides a framework for designing and implementing research that engages Ghanaian women in the development of renewable energy solutions and climate resilience strategies, potentially resulting to more effective and sustainable outcomes.

Participatory communication prioritises the perspectives of local communities, which is crucial for understanding and addressing the specific challenges women in Ghana face in relation to energy access and climate change adaptation (Tufte & Mefalopulos, 2009). The emphasis on dialogue rather than top-down information dissemination can facilitate better understanding of women's needs and perspectives regarding energy and climate issues (Mefalopulos, 2008).

This theory supports the study focus on promoting the engagement of marginalised groups, specifically women, in development processes. It aligns with the research focus on ensuring

women's participation in renewable energy initiatives and climate resilience efforts in Ghana as highlighted by Servaes and Malikhao (2005). The theory's emphasis on empowering communities to assume responsibility of their development is particularly relevant to enhancing women's involvement in the adoption of renewable energy and their ability to withstand the impacts of climate change (Freire, 1970). Understanding the distinct cultural and social circumstances in Ghana is crucial for devising successful approaches to engage women in renewable energy projects (Gumucio-Dagron & Tufte, 2006).

Promoting active participation can result in the development of sustainable and locally driven solutions for the adoption of renewable energy and climate resilience (Servaes, 2008).

2.10 Chapter Summary

In this chapter, the concept of renewable energy was highlighted by considering the various sources of renewable energy, the need to adopt renewable energy in the place of non-renewable energy, and the current state of renewable energy in Ghana. The role of women in the renewable energy transition, and the challenges women face were discussed. Various studies on climate resilience in Ghana, as well as inclusivity and participatory processes were explored. A theoretical framework on which the study is based was established and explained.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

This chapter of the academic inquiry focuses on the comprehensive methodology employed for this study. It provides an account of the research design, target population, sample and sampling technique, sources of data, data collection methodology and data analysis methodology as well as ethical considerations that guide the research.

3.1 Research Philosophy

Research philosophy is concerned with the expansion of knowledge and incorporates crucial presumptions regarding an individual's point of view on the world (Saunders et al, 2019). It is a scholar's collective understanding of what constitutes truth, reality, and knowledge. Positivism, realism, pragmatism, and interpretivism are the four primary philosophical paradigms in research. The study adopts the philosophy of Positivism as a guide for the research. This philosophy originated from the natural sciences which places emphasis on the empirical testing of hypotheses and the discovery of logical or mathematical evidence that may be derived from statistical analysis (Collis & Hussey, 2014, p.44). Positivism is a research philosophy that a researcher employs when performing quantitative research since it deals with experimentation and is believed to be a type of empirical study. It is a scientific approach that is rooted in the idea that knowledge is derived from observable and measurable facts, emphasizing objectivity, empirical evidence, and generalizable findings (Bryman, 2016). An assumption of the Positivism philosophy is that reality is external and independent of human perception, allowing researchers to discover trends and relationships through systematic observation and analysis (Saunders et al., 2019).

Positivism is appropriate in the context of this research because the study employs a structured data collection method and quantitative analysis to achieve its objectives. This use of survey responses and statistical tools ensures that the research findings are based on observable and quantifiable phenomena, minimizing subjectivity and bias.

3.2 Research Approach

The researcher used the quantitative method. According to Ragab and Arisha (2018), a quantitative study collects numerical data for analysis using statistical techniques to explain a phenomenon.

A quantitative approach is used when a researcher collects data on predetermined instruments using research techniques, such as experiments and surveys, resulting in statistical data (Williams, 2007). It produces accurate and quantifiable data that can be extrapolated to larger populations (Mertens, 2014). Additionally, it is appropriate to test the hypotheses developed before data collection to validate previously established theories about how and why events occur. In general, quantitative research is viewed as a deductive approach to learning (Almalki 2016).

The quantitative research method enabled the researcher to analyze the barriers faced by women in the renewable energy sector and their participation in ensuring climate resilience in Ghana. The quantitative approach focused principally on the application of statistical methods to record, analyze, and understand the phenomenon (Dawson, 2002; Bryman, 2006; 2012).

3.3 Research Design

A researcher's entire strategy for finding the answers to their study questions is called a research design (Amedahe & Asamoah-Gyimah, 2015). Wilson (2016) defined research design as the basic plan for collecting, computing, and analyzing data for a research report. The data collection for this structure includes information about the information type, sources, and processes to be used as well as how the information will be obtained. This study employed a descriptive research design. According to Saunders et al. (2014), a descriptive design can elicit positive responses from a wide range of people. This is thought to be the best design because it will make it easier for the researcher to interpret the study findings. The goal of the design is to observe, categorize, and record a situation as it happens (Adam, 2015).

Despite the benefits, this design focused on the conceptualization, and operationalization of numerous constructs that create measuring challenges, and this thereby posed a problem to the validity and reliability of the instruments deployed for data collection (Creswell & Plano Clark, 2011; Cohen et al., 2007).

3.4 Target Population

The target population for the study is the staff of the Green Africa Youth Organization (GAYO) in Ghana and the executives of the 350 Ghana Reducing Our Carbon (350 Ghana). GAYO Ghana has a total staff size of approximately 25 employees whereas 350 Ghana has an executive team of 7 employees. This brings the total number of the target population to 32. As such, results of the study could reliably be generalized as a statistical representation of the research sample size. This population was purposely selected because of their in-depth knowledge and understanding about the phenomenon.

3.5 Sampling Technique

Etikan and Bala (2017) also posit that there is no one best sampling strategy; rather, it depends on the nature and goal of the research. The sampling strategy used for this research is a non-probability sampling technique referred to as purposive sampling. It is also known as expert sampling. This technique is used to select the respondents in a non-random manner on the basis of their knowledge or expertise relevant to the study (Bhattacherjee, 2012). The researcher used the purposive sampling strategy to get respondents who were knowledgeable and in-depth about the topic (Creswell & Plano Clark, 2011, p.174). Additionally, purposive sampling allowed the researcher to target specific individuals or groups within the organization who had relevant knowledge or experience on the topic being studied. Overall, the use of purposive sampling allowed the researcher to achieve a more representative and informative sample population for the study.

3.6 Sample

A sample is a subset of participants which is drawn from the target population (Martinez et al., 2016). According to Kothari (2012), the number of study participants who should be included in the sample is based on the nature of the study and the research design. The researcher employs a 95% confidence interval in estimating the sample. This leaves a 5% margin of error in the estimation analysis. In arriving at the sample size, the researcher employs the formula adopted by Kothari (2004).

$$\mathbf{n} = \frac{N}{1+N(e)^2}$$

Where, **n** is sample size

N is total population

e is the margin of error

In the study, N is 32 and e is 5% (0.05). To calculate the sample size n;

$$\mathbf{n} = \frac{32}{1+32(0.05)^2}$$

$$\mathbf{n} = \frac{32}{1+32\ (0.0025)}$$

$$\mathbf{n} = \frac{32}{1+0.08}$$

$$\mathbf{n} = \frac{32}{1.08}$$

n = 29.6

n = 30 (1 d.p)

3.7 Sources of Data

There should be congruence between the research question and the method of analysis chosen, as suggested by Walliman (2015). Primary data and secondary data are the two most common types. Primary data are those gathered directly by the researcher through activities like questionnaires, interviews, and experiments. The data for this research was gathered from a primary source, as it represents the unadulterated data obtained first hand from participants, thus a higher level of validity as compared to secondary data. However, secondary data is information that has already been gathered but for a different purpose. Literature, government reports, and electronic databases are common places to find this information. This data is considered historical and already in existence.

Primary data is often considered more reliable and valid as it is collected specifically for the research project, allowing the researcher to tailor their data collection efforts to their unique research question and hypotheses. However, secondary data can also be useful as it can provide broader context for the research and can be used to supplement primary data.

The use of primary data in this study was crucial in obtaining detailed and specific information about the barriers faced by women in the renewable energy sector and some inclusive and

participatory processes which when adopted will enable them to contribute to climate resilience efforts in Ghana. Overall, the use of primary data in this study allowed for a more in-depth examination of the research question and provided a more accurate representation of the situation in Ghana.

3.8 Data Collection Methodology

A well-structured closed-end questionnaire was designed to solicit primary data from all sample respondents for the study. Questionnaires are more objective than interviews since they gather responses to specified questions in a standardized fashion (Milne, 2011). The use of closed-ended questionnaires was deemed the most appropriate method for the study as it provided participants with ample time to respond and supported the quantitative research design. Additionally, closed-ended questionnaires are simple to understand and may result in a higher response rate as they are easy to administer and complete (Bell et al., 2022).

Participants were allowed to choose the most suitable response to each topic, and the questionnaire items included all the essential information to answer the study questions. The standardization of questionnaires makes it feasible to clarify any questions that participants may misunderstand.

The questionnaire included a 5-point Likert scale which measured responses from "1- Strongly Agree (SA)" to "5- Strongly Disagree (SD)" to measure the variables of interest.

The questionnaire was divided into four parts; questions about the current state of renewable energy in Ghana were included in Part One, and the role of women in the renewable energy transition in Ghana in Part Two. Part Three was about barriers that limit women's inclusivity and participation in the energy transition in Ghana, and Part Four included questions on effective inclusive and participatory processes.

3.9 Data Analysis Methodology

All questionnaires obtained were edited, which includes checking for completeness and inconsistencies while ensuring there is no form of bias. The data collated were numbered to avoid double counting and double entry. Also, the questionnaires were checked for possible blank responses for appropriate measures. The data was then analyzed using the International Business Machines Corporation's Statistical Package for Social Sciences (SPSS) to ensure validity and reliability of the data. Both descriptive and inferential statistics were used for data analysis. Tables, frequencies, and percentages were used for the descriptive statistics.

3.10 Ethical Considerations

Ethical consideration in research is very crucial and necessary for both the researcher and the subject of the study. According to Brown (2015), ethical research is done by balancing the value of advancing knowledge against the value of not interfering with the lives of others. Ethical issues were addressed by seeking consent and ensuring the anonymity and confidentiality of each participant. Respondents were given the option of participating willingly in the study rather than being forced to do so. This is because they will provide misleading evidence if they are not allowed to participate of their own free will, jeopardizing the research goal.

The study's objectives, potential implications, and outcomes were explained to the study's participants. As a result, the information provided was solely based on informed consent. The researcher inserted a provision in the questionnaire's introductory paragraph assuring respondents of privacy and confidentiality. Finally, the respondents and the researchers settled on the length of time it would take to complete the questionnaire.

3.11 Chapter Summary

The research techniques utilized to conduct the study were covered in this chapter, along with the justifications that accompanied them. It looked at the research methodology, design, target population, sample size and sampling technique, and tool. The chapter also covered the data collection and analysis methods to test the study's hypothesis.

Additionally, ethical considerations were addressed to ensure that the research does not cause harm to the participants and the researcher and also to reduce biases. The findings of the research are covered in the next chapter.

CHAPTER FOUR

PRESENTATION AND ANALYSIS OF FINDINGS

4.0 Introduction

This chapter analyses and interprets the data gathered from survey in order to aid the researcher draw the relevant conclusions and make due recommendations. The survey data is analyzed using descriptive statistics such as frequency distributions, mean scores, and standard deviations as well as inferential statistics. The data and analysis are presented in a clear and concise manner, with tables used to enhance the understanding of the results. The findings are discussed in relation to the research objectives. Finally, this chapter concludes by summarizing the key findings and discussing their implications for Ghana's renewable energy sector and thus, climate resilience.

4.1 Current State of Renewable Energy in Ghana

The first objective of this study was to assess the current state of renewable energy in Ghana. The survey was based on a Likert scale, where 1 = strongly disagree, 2 = disagree, 3 = agree, 4 = agree, and 5 = strongly agree. The level of each item was determined by the following formula: (highest point on the Likert scale – the lowest point on the Likert scale)/the number of the levels used = (5 − 1)/5 = 0.80, where 1 - 1.80 reflected by very low, 1.81 - 2.60 reflected by low, 2.61 - 3.40 reflected by moderate, 3.41 - 4.20 reflected by high, and 4.21 - 5 reflected by very high. The survey results are presented in Table 1 below.

Table 1: SPSS Data Results on the Current State of Renewable Energy

	N	Minimum	Maximum	Mean	Std. Deviation
Renewable energy sources are widely available in Ghana	30	1	5	2.53	1.279
The government of Ghana is effectively promoting renewable energy initiatives	30	1	4	2.47	.937
There is sufficient investment in renewable energy infrastructure in Ghana	30	1	4	2.07	.740
Ghana's current energy policy strongly supports the transition to renewable energy	30	1	5	3.43	1.006
The adoption of renewable energy in Ghana is progressing at a satisfactory rate	30	1	4	2.50	.777
Public awareness and education on renewable energy are well promoted in Ghana	30	1	5	2.77	1.104
The private sector is actively involved in the development of renewable energy in Ghana	30	1	5	3.67	.758
Valid N (listwise)	30				

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	2.688	2.067	3.667	1.600	1.774	.343	8

The result from Table 2 reveals a nuanced perception of respondents of Ghana's renewable energy sector which highlights some progress as well as shortcomings. The mean score of 3.43 for the statement "Ghana's current energy policy strongly supports the transition to renewable energy" shows that the respondents strongly agree that Ghana has policies which supports the transition to renewable energy. It suggests that existing policies may show commitment to Ghana's transition but lack full effectiveness. Policy alone does not guarantee meaningful change but rather, effective implementation coupled with sufficient resources and stakeholder engagement is crucial for advancing energy transitions (Nzeneri et al., 2021; Alston, 2014). Again, while the statement, "The private sector is actively involved in the development of renewable energy in Ghana" has a mean of 3.67, indicating that respondents agree to some extent that the private sector in Ghana is involved in the growth of Ghana's renewable energy sector, the score implies that the role of the private sector may not be as strong as required to drive significant growth. Low mean values below the neutral midpoint for statements about infrastructure investment, government promotion of renewable energy, adoption rate and public awareness, suggest critical views about the pace and scale of renewable energy initiatives in Ghana, highlighting barriers to renewable energy development in Sub-Saharan Africa, including limited funding, insufficient infrastructure, and weak policy enforcement, all of which hinder meaningful progress in renewable energy adoption (International Renewable Energy Agency, 2019; Clancy et al., 2020). the renewable energy sector in Ghana and other Sub-Saharan African nations is often stifled by a lack of consistent policy implementation and adequate financial investment (Nzeneri et al., 2021; Melkote & Steeves, 2021). For example, Nzeneri et al. (2021) found that while Ghana has introduced several renewable energy policies, these often lack the necessary follow-through, partly due to limited government resources and reliance on external funding. In many cases, policy goals and outcomes diverge due to weak

institutional structures and insufficient collaboration with local communities, which are vital for successful renewable energy adoption (Alston, 2014).

Considering the summary statistics, the 2.688 mean score of the overall perception and awareness variables indicate a low awareness or a somewhat critical view of Ghana's renewable energy. It also means that on average, respondents are somewhat closer to disagreement than agreement that Ghana's renewable energy sector is growing although it leans toward a neutral response. This suggests that there is a need for Ghana to adopt more participatory approach to its renewable energy development to build climate resilience.

4.2 Role of Women in the Renewable Energy Transition in Ghana

The second objective of this study was to analyse the role of women in the renewable energy transition in Ghana. The survey was based on a Likert scale, where 1 = strongly disagree, 2 = disagree, 3 = agree, 4 = agree, and 5 = strongly agree. The level of each item was determined by the following formula: (highest point on the Likert scale – the lowest point on the Likert scale)/the number of the levels used = (5 − 1)/5 = 0.80, where 1 - 1.80 reflected by very low, 1.81 - 2.60 reflected by low, 2.61 - 3.40 reflected by neutral, 3.41 - 4.20 reflected by high, and 4.21 - 5 reflected by very high. The survey results are presented in Table 2.

Table 2: SPSS Results on the Role of Women in Renewable Energy Transition in Ghana

	N	Mean	Std. Deviation
Women play a significant role in decision-making processes related to renewable energy	30	2.70	1.149

Women's perspectives are considered in renewable energy policy-making	30	2.53	1.106
There are visible female leaders in Ghana's renewable energy sector	30	3.03	1.129
Women have equitable access to opportunities in the renewable energy industry	30	2.67	1.028
Training and capacity-building programs in renewable energy adequately include women	30	3.43	1.135
Women are well-represented in technical roles within the renewable energy sector	30	2.57	1.040
Policies are in place to support the involvement of women in renewable energy initiatives	30	2.77	.898
There is strong advocacy for increasing women's participation in the renewable energy transition	30	3.43	1.104
Valid N (listwise)	30		

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	2.892	2.533	3.433	.900	1.355	.135	8

The renewable energy sector although one of the fastest-growing fields globally, continues to reflect a notable gender gap with women constituting about 32% of the workforce compared

to 22% in the traditional or conventional energy sector (International Renewable Energy Agency, 2022). International Energy Agency (IEA, 2023) data shows that within the renewable energy sector, only 15-20% leadership roles and 28% of Science Technology Mathematics (STEM) technical roles are held by women, while a higher percentage of them are likely to be occupying administrative, sales and distributing roles. In Ghana, women make up around 25% of the renewable energy workforce with lower representation in technical and leadership roles which is consistent with global trends (Ghana Energy Commission, 2023).

Findings from this study reflected a total mean score of 2.89 total for statements assessing the role of women in the renewable energy transition in Ghana. This suggests that on average, respondents perceive a lack of adequate representation and support for women in Ghana's renewable energy sector. This result shows that respondents have a neutral to somewhat disagreeing stance that women are adequately represented, supported, and advocated for within Ghana's renewable energy sector, possibly suggesting that there may be a lack of clarity about the sector's efforts to improve women's inclusivity. It reflects how little efforts have been made to ensure that women are well represented in the renewable energy industry in Ghana. Lower mean values were obtained for statements including, "Women's perspectives are considered in renewable energy policy-making (2.53), Women have equitable access to opportunities in the renewable energy industry (2.67), Women are well-represented in technical roles within the renewable energy sector (2.57)" which supports this claim. It aligns with existing research indicating that women are not well represented in technical and decision-making roles as a result of slack of targeted recruitment, inadequate gender sensitive policies in the renewable energy sector and societal norms (Clancy et al., 2020; Nzeneri et al., 2021). The participatory communication theory on which this study is hinged critiques top-down approaches that exclude voices for inclusive processes that empower underrepresented groups. Women's participation in the renewable energy industry is more than simply about equality, it is

increasingly recognised as critical for generating innovation, enhancing project outcomes, and ensuring an inclusive energy transition (International Renewable Energy Agency, 2019). By excluding women from decision-making and leadership roles, the renewable energy sector in Ghana is robbed of critical contributions and insights that could strengthen community adaptation and resilience to climate change. Melkote & Steeves (2021) posit that participatory communication strategies can help resolve such gaps by emphasizing the need to actively include women particularly in roles that influence project outcomes. Bessette (2004) highlights that sustainable development efforts are more likely to succeed when inclusive or participatory communication processes are involved to ensure that marginalized groups like women are given agency and voice. To foster a more innovative sector in Ghana, the participatory communication approach must be integrated across all levels of the renewable energy sector. The findings of this assessment reflects the need for this approach as the sector appears to be lacking inclusive and participatory strategies that allow women to fully contribute. This provides insight into areas where potential improvements might be needed such as mentorship programs that encourage women's entry into leadership and technical roles within Ghana's renewable energy sector. To address this, it is essential for the renewable energy sector in Ghana to adopt participatory, gender-responsive strategies that promote inclusivity, thereby empowering women at all levels from decision-making to technical fields. This aligns with the participatory communication theory's emphasis on empowerment and equitable participation and will create a more inclusive and sustainable energy transition.

4.3 Barriers to Women's Inclusivity and Participation in the Renewable Energy Sector

Another objective of this study was to identify the barriers that limit women's inclusivity and participation in the renewable energy transition in Ghana. The survey was based on a Likert scale, where 1 = strongly disagree, 2 = disagree, 3 = agree, 4 = agree, and 5 = strongly agree. The level of each item was determined by the following formula: (highest point on the Likert scale – the lowest point on the Likert scale)/the number of the levels used = (5 − 1)/5 = 0.80, where 1 - 1.80 reflected by very low, 1.81 - 2.60 reflected by low, 2.61 - 3.40 reflected by moderate, 3.41 - 4.20 reflected by high, and 4.21 - 5 reflected by very high. The survey results are presented in Table 3.

Table 3: SPSS Results on Barriers to Women's Inclusivity and Participation in the Renewable Energy Sector

	N	Minimum	Maximum	Mean	Std. Deviation
Cultural norms limit women's participation in the renewable energy sector	30	1	5	3.23	1.305
Women face significant discrimination when entering the renewable energy industry	30	1	5	2.97	1.066
Limited access to education and training restricts women's involvement in renewable energy industry	30	1	5	3.40	1.248

Less access to networks and mentorship programs discourages women from pursuing careers in renewable energy.	30	1	5	3.50	1.225
Financial constraint is a major hinderance for women in the renewable energy sector	30	1	5	3.83	1.177
Valid N (listwise)	30				

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	3.387	2.967	3.833	.867	1.292	.103	5

The answers provided by respondents on statements which sought to investigate the barriers women face when entering and participating in the renewable energy sector have a mean of 3.387. This suggests that respondents perceive various systemic and structural barriers, such as cultural norms, discrimination, limited access to education and mentorship, and financial constraints, as generally relevant issues that affect women's involvement in Ghana's renewable energy industry. The mean value of 3.83 found for the statement, financial constraints is a major hinderance for women in the renewable energy sector" suggests the respondents view an financial constraints as a primary barrier to women's participation in Ghana's renewable energy sector. Financial constraints hinder women's access to relevant training, technology, and networking opportunities which are essential for grounding in the renewable energy sector. Women in emerging economies face more difficulty in securing financial aid for training and entrepreneurship (Karekezi & Kithyoma, 2020). This barrier inhibits women's capacity to participate and thrive in Ghana's renewable energy sector. The participatory communication theory advocates for the empowerment of marginalized groups to engage in conversations that

impact their work environment (Freire, 1970). Women will be empowered to actively participate and contribute to achieving climate resilience in Ghana and a diverse sector landscape when financial support is provided for them. Also, the standard deviation values for the responses on each item in Table 3 is above 1 indicating diverse opinions on the issues. This diversity may be indicative of varying individual experiences based on factors like education level. However, the fact that the mean is above the midpoint of 3 implies that these barriers are seen as significant but not extreme obstacles to women's participation in renewable energy. This shows that respondents may believe these issues do impact women but to varying extents. Studies highlight that gender-specific barriers in the energy sector which include limited access to technical education and social-cultural expectations often disadvantage women (Clancy et al., 2020; International Renewable Energy Agency, 2019). This alignment between empirical findings and existing literature underscores how systemic structures affect women's participation in this sector. Sovacool (2021) presents that cultural norms and limited mentorship constrain women's potential participation and leadership, thereby reinforcing a lack of diversity in the energy industry. The moderate 2.97 mean score of the statement, "Women face significant discrimination when entering the renewable energy industry" suggests that respondents perceive this as a less crucial barrier. This corroborates some studies that reveal that women in male-dominated sectors may not always openly face gender discrimination but rather more subtle barriers like exclusion from key networks (Martin & Barnard, 2013).

The findings suggests significant, though varied barriers to women's participation in the renewable energy sector of Ghana which indicates the need for targeted intervention. This insight is relevant for identifying areas where additional support, resources, or policy changes might be required to reduce these perceived barriers to enhance women participation and inclusivity in Ghana's renewable energy sector, thereby contributing to its climate resilience.

It also highlights a generally shared perception of challenges that could inform discussions or initiatives aimed at improving support for women in this field.

4.4 Effective Inclusive and Participatory Processes

The fourth objective of this study was to evaluate women's inclusive and participatory processes that result in climate resilience in Ghana. The survey was based on a Likert scale, where 1 = strongly disagree, 2 = disagree, 3 = agree, 4 = agree, and 5 = strongly agree. The level of each item was determined by the following formula: (highest point on the Likert scale – the lowest point on the Likert scale)/the number of the levels used = (5 − 1)/5 = 0.80, where 1 - 1.80 reflected by very low, 1.81 - 2.60 reflected by low, 2.61 - 3.40 reflected by moderate, 3.41 - 4.20 reflected by high, and 4.21 - 5 reflected by very high. The survey results are presented in Table 4.

Table 4: SPSS Results on Effective Inclusive and Participatory Processes

	N	Minimum	Maximum	Mean	Std. Deviation
Gender-responsive policies significantly impact climate resilience efforts	30	2	5	3.73	.980
Women inclusivity in community-based renewable energy project planning results in more sustainable outcomes.	30	2	5	3.97	.850
Women-led education programs effectively increase public awareness of renewable energy.	30	2	5	4.03	.850

Training and mentorships programs encourage women to pursue careers in renewable energy.	30	3	5	4.37	.669
Funding programs for women entrepreneurs increases renewable energy initiatives.	30	3	5	4.23	.774
Valid N (listwise)	30				

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	4.067	3.733	4.367	.633	1.170	.060	5

This section aimed to evaluate women's inclusive and participatory processes that result in climate resilience in Ghana. The summary mean of 4.067 indicates that respondents agree or strongly agree with these statements about the positive impact of gender-responsive and women-inclusivity initiatives on Ghana's renewable energy industry and its climate resilience. United Nations Women (2018) support this perspective by highlighting that gender inclusivity can lead to more effective and sustainable climate action strategies. In Ghana where cultural and systemic barriers traditionally limit women's involvement and participation in renewable energy, the participatory communication theory aligns with respondents' perception that inclusive policies are critical for climate resilience. Studies show that involving women in environmental governance not only enhances project effectiveness but also supports equitable economic growth and resilience in the face of climate change (Nzeneri et al., 2021).

More specifically, the mean score shows that, on average, respondents view inclusive and participatory efforts like gender-responsive policies, women-inclusive project planning, mentorship programs, and funding for women entrepreneurs as significant and effective in

promoting women participation and contribution towards Ghana's climate resilience and renewable energy development. This high mean score as well as a low variance reflects a shared perception among respondents that such inclusive initiatives are important and possibly indicating strong support for policies and programs that promote women's involvement in Ghana's climate and renewable energy sectors. Thus, underscoring the importance for the continuance or expansion of such efforts. It also shows that respondents likely perceive these initiatives as necessary for enhancing public awareness of Ghana's renewable energy sector which is lacking as proven by the result in section 4.1, community involvement, and overall effectiveness in the renewable energy industry.

Gender-responsive policies in the energy sector leads to more inclusive and innovative solutions as well as resilience by diversifying the landscape and thus, broadening the range of skills and perspectives (International Renewable Energy Agency, 2019; Clancy et al., 2020). Women, when empowered through mentorship and access to resources can contribute more effectively to renewable energy projects, thereby advancing climate goals and promoting sustainable sector practices. Respondents' agreement on the need for continued or expanded women-inclusive policies shows the practical application of participatory theory in promoting agency and inclusive governance structures. Ghana's renewable energy sector can incorporate women's insights into resilience strategies which will likely result in creating a more inclusive and effective climate action framework. Respondents' agreement of gender-inclusive initiatives (Women-led education programs effectively increase public awareness of renewable energy with a mean score of 4.03) also suggests that respondents see these initiatives as important for increasing public awareness and community involvement in renewable energy. This reflects an understanding that communication initiatives within communities based on gender-sensitive approaches, can facilitate greater local engagement in renewable energy initiatives. Such initiatives enables women to act as advocates and educators within their communities, thereby

promoting public awareness of renewable energy's benefits and importance for Ghana's climate resilience. Women's participation often leads to greater community support and project adoption (Mohapatra et al., 2019). The involvement of women in project planning in Ghana's renewable energy sector can improve community acceptance, advance climate goals and promote resilience.

4.5 Climate Resilience and Women's Participation

The section sought to investigate the extent to which the respondents agree or disagree with statements which relate to climate resilience and women's participation. The survey was based on a Likert scale, where 1 = strongly disagree, 2 = disagree, 3 = agree, 4 = agree, and 5 = strongly agree. The level of each item was determined by the following formula: (highest point on the Likert scale – the lowest point on the Likert scale)/the number of the levels used = (5 − 1)/5 = 0.80, where 1 - 1.80 reflected by very low, 1.81 - 2.60 reflected by low, 2.61 - 3.40 reflected by moderate, 3.41 - 4.20 reflected by high, and 4.21 - 5 reflected by very high. The survey results are presented in Table 5.

Table 5: SPSS Results on Climate Resilience and Women's Participation

	N	Minimum	Maximum	Mean	Std. Deviation
Increased women's participation in renewable energy initiatives improves community adaptation to climate change	30	3	5	4.17	.648

Gender-balance in renewable energy decision making leads to more effective climate resilience strategies	30	3	5	4.37	.718
Women-led households are more likely to adopt climate-resilient energy practices	30	3	5	3.93	.828
Women's traditional knowledge contributes to climate-resilient energy policies and solutions	30	2	5	3.90	.960
Empowering women in the renewable energy sector strengthens overall community resilience to climate change	30	3	5	4.53	.629
Valid N (listwise)	30				

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	4.180	3.900	4.533	.633	1.162	.075	5

A total summary mean score of 4.18 signifies that respondents generally agree to strongly agree with statements asserting the positive outcomes associated with increased women's participation in Ghana's renewable energy and climate resilience efforts. This mean score implies that respondents perceive that women's involvement with traditional knowledge, through leadership, and community empowerment, contributes significantly to climate resilience and effective renewable energy practices in Ghana. Specific variables like "increased women's participation in renewable energy improves initiatives community adaptation to climate change" and "empowering women in the renewable energy sector strengthens overall

community resilience to climate change" are perceived positively, implying a shared belief in the value of women inclusivity in building community resilience against climate change, policy effectiveness and the adoption of climate-resilient or sustainable energy practices. The positive perception of respondents aligns with studies that highlight the significant role played by women in sustainable environmental practices due to their unique knowledge of local ecosystems and community needs (Alston, 2014; International Renewable Energy Agency, 2019). The participation of women is revealed to increase project effectiveness by ensuring that climate initiatives are rooted in community-specific knowledge, ultimately fostering more resilient outcomes. Views of respondents on variables such as "increased women's participation in renewable energy improves community adaptation to climate change" and "empowering women strengthens overall community resilience to climate change" align with literature that underscores the value of traditional knowledge in sustainable development (Nyantakyi-Frimpong & Bezner Kerr, 2015). Women's traditional knowledge of natural resources and adaptation practices contributes significantly to climate resilience, especially in rural areas where local environmental knowledge is critical. Their role in the family allow them to advocate for practices that address specific vulnerabilities challenging households and communities, thereby promoting a more holistic approach to climate resilience. The participatory communication theory supports inclusive, bottom up approaches that acknowledge and integrate local expertise. When women are involved as key stakeholders in renewable energy and climate resilience planning, they contribute valuable insights that enhance the sustainability and cultural relevance of these initiatives. Thus, the respondents' views reflect an understanding of participatory communication's principles that empowering women to share their traditional knowledge enriches climate adaptation strategies and ensures that policies resonate with local needs and practices. This finding suggests an endorsement of respondents' for gender-balance in Ghana's renewable energy sector. It also suggests more and

deliberate support for gender-inclusive and participatory approaches and efforts, as respondents view them as critical to achieving climate resilience and an improved renewable energy sector in Ghana.

4.5.1 Correlation between Effective Inclusive and Participatory Processes and Climate Resilience and Women's Participation

To establish a relationship between effective inclusive and participatory processes (Part 4) and climate resilience and women's participation (Part 5), a correlation matrix was developed. The results are presented in Table 6.

Table 6: SPSS Inter-Item Correlation Matrix on Part 4 and Part 5 Responses

Inter-Item Correlation Matrix										
	Gender-responsive policies	Women inclusivity in community-based renewable energy project planning	Women-led education programs.	Training and mentorships programs	Funding programs for women entrepreneurs	Increased women's participation in renewable energy initiatives	Gender-balance in renewable energy decision making	Women-led households	Women's traditional knowledge	Empowering women in the renewable energy sector
Gender-responsive policies	1.000	.485	.342	.365	.267	.181	.291	.360	.484	.462

Women inclusivity in community-based renewable energy project planning	.485	1.000	.574	.325	.484	.386	.529	.291	.418	.550
Women-led education programs.	.342	.574	1.000	.402	.459	.365	.431	.493	.258	.546
Training and mentorships programs	.365	.325	.402	1.000	.495	.332	.357	.108	.167	.585
Funding programs for women entrepreneurs	.267	.484	.459	.495	1.000	.470	.461	.079	.172	.444
Increased women's participation in renewable energy initiatives	.181	.386	.365	.332	.470	1.000	.753	.214	.139	.621

Gender-balance in renewable energy decision making	.291	.529	.431	.357	.461	.753	1.000	.274	.205	.697
Women-led households	.360	.291	.493	.108	.079	.214	.274	1.000	.643	.402
Women's traditional knowledge	.484	.418	.258	.167	.172	.139	.205	.643	1.000	.434
Empowering women in the renewable energy sector	.462	.550	.546	.585	.444	.621	.697	.402	.434	1.000

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Inter-Item Correlations	.396	.079	.753	.674	9.542	.024	10

Based on the output of this reliability analysis, there is a correlation of 0.396 which signifies a moderate positive relationship among the variables related to women's participation and inclusion in Ghana's renewable energy sector and climate resilience. This moderate correlation indicates that these variables are interconnected, highlighting the potential for targeted

strategies that enhance women inclusivity and the effectiveness of renewable energy policies. Otherwise put, it means that as the score of one variable increases, the scores of the other variables also tend to increase. This implies that improvements in one area or variable, for instance, “Women inclusivity in community-based renewable energy project planning results in more sustainable outcomes,” are likely to enhance another variable, “Increased women’s participation in renewable energy initiatives improves community adaptation to climate change”. The moderate correlation also indicates that gender-responsive policies, inclusivity, and empowerment programs in Ghana’s renewable energy sector are interrelated. It suggests that improvements in one area (For example, funding programs for women entrepreneurs) could positively influence others (For example, women-led education programs increasing public awareness). This aligns with findings from studies on gender and sustainable energy, which show that women’s inclusion often yields benefits across multiple dimensions of development and climate adaptation (Clancy et al., 2020; International Renewable Energy Agency, 2019). Literature on gender and development corroborates that initiatives supporting women’s participation, such as mentorship and entrepreneurship funding, frequently have compounding effects. For instance, empowering women to lead community-based energy initiatives has been shown to increase both sustainability outcomes and community buy-in (Morioka & Choudhury, 2020). Similarly, gender-inclusive policies that facilitate women’s roles in renewable energy can lead to increased public awareness and support for climate adaptation practices (Nzeneri et al., 2021). Participatory communication emphasizes the significance of bringing on board all relevant actors or involving relevant voices, particularly those of marginalized groups to create change, and in this context, to create resilient and sustainable communities. The interconnectedness of the variables is a probability that promoting inclusivity in decision-making processes can create positive spill over or ripple effects across various sectors.

4.6 Chapter Summary

This chapter presented and analysed the data collected for the study. The data was analysed using the International Business Machines Corporation's Statistical Package for Social Sciences (SPSS) and presented using tables. It was then interpreted based on relevant scholarly research and the theoretical underpinning of the study. The finding from this chapter will inform the conclusion and recommendations to be made in the next chapter.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

Chapter Five presents a comprehensive summary of the findings which aimed to address the study objectives. The results of the analysis are presented in tables and figures and also discussed in detail. Furthermore, it includes a discussion of the findings in relation to previous literature on the subject. The chapter concludes with recommendations for the study and for future research.

5.1 Summary of the Study

This study explored how women contribute to climate resilience through participation in the renewable energy sector as well as the impact of gender-responsive policies, inclusivity initiatives, and empowerment programs within the renewable energy sector, examining how these factors are interrelated and contribute to both women participation climate resilience in Ghana. Recognizing the critical need to integrate gender considerations in addressing climate change and advancing renewable energy, this research highlights how empowering women in technical and leadership roles, supporting women entrepreneurs, and implementing inclusive policies can enhance the effectiveness of renewable energy initiatives.

The study's primary objectives were to (1) assess the current state of renewable energy in Ghana within renewable energy, (2) analyse the role of women in the renewable energy transition in Ghana, (3) identify the barriers that limit women's inclusivity and participation in the energy transition in Ghana, (4) Evaluate women's inclusive and participatory processes that result in climate resilience in Ghana. Utilizing survey data from stakeholders in renewable energy, the analysis employed correlation methods to investigate the relationships among

variables such as policy support, funding programs for women, representation in technical roles, and the visibility of female leadership in the industry.

The correlation analysis indicated a moderate positive relationship (r = 0.396) between variables related to gender-responsive policies, inclusivity, and empowerment. This suggested that improvements in one area, such as increased funding for women entrepreneurs, are likely to positively influence others, like public awareness campaigns led by women. However, the correlation is not particularly strong, implying that while these factors are interrelated, they also require distinct approaches to fully maximize their impact.

Further, the study found that gender-responsive policies play a foundational role in supporting a gender-balanced environment. Policies advocating for training, mentorship, and leadership opportunities for women are essential for improving their representation in decision-making roles and technical positions, which can drive greater overall effectiveness in the renewable energy sector.

5.2 Key Findings

The research found that while Ghana has made progress in the development of its renewable energy sector, substantial gaps still exist in policy execution, private sector involvement, infrastructure investment, and public awareness. This highlights the importance of comprehensive and participatory policies to achieve significant progress and create climate resilience.

Again, the study discovered a moderately positive correlation (r = 0.396) between gender-responsive policies, inclusion measures, and empowerment programs in the renewable energy sector. This suggests that advancements in one area, such as improved funding for female entrepreneurs, are likely to have a positive impact on others, such as increasing public

awareness and encouraging female leadership. This interconnectivity emphasises the significance of a comprehensive strategy to women inclusion, though the moderate correlation shows that distinct techniques are also required to maximise impact in each area.

Also, the study also found a relationship between Ghana's climate resilience and women's inclusiveness and involvement in the renewable energy industry. This suggests that women's increased participation in renewable energy improves climate resilience, supporting the notion that gender inclusion is not only important for the industry but also broader climate adaptation and resilience efforts.

Further, Gender-responsive policies were discovered to be critical in creating a supportive environment for women in the renewable energy sector. To increase women's participation in technical and decision-making positions, policies that support leadership development, mentoring, and training are crucial. These regulations not only help to increase the number of women in positions of influence, but also strengthen the sector's effectiveness, improve the success and sustainability of renewable energy projects.

Furthermore, empowering women in technical and leadership roles, as well as supporting female entrepreneurs, has been found to increase the effectiveness of renewable energy initiatives. The study emphasises how renewable energy projects, especially in Ghana, are better designed to address climate resilience when women are included in technical and decision-making roles. This finding supports the active promotion of women's participation in the renewable energy sector at all levels in order to increase the industry's contributions to both energy transition and climate resilience.

5.3 Conclusion

This study reveals that there is a relationship between increased women's participation in renewable energy sector in Ghana and its climate resilience. It demonstrates that inclusivity and participatory efforts which translates into empowerment programs for women in Ghana's renewable energy are moderately interconnected, with potential for positive cross-impact if strategically strengthened. By implementing the recommendations of this study, stakeholders in Ghana's renewable energy industry can promote an environment where gender equality and climate resilience reinforce one another, thereby creating a more inclusive, sustainable future. This study highlights the need for continued research and tailored interventions to strengthen the role of women in renewable energy, contributing both to sectoral innovation and broader social equity objectives.

5.4 Limitations of the Study

Despite the relevant findings of the study, the researcher identified some limitations which are discussed below.

To begin with, this study did not assess existing policies and funding mechanisms specific to women entrepreneurs in Ghana's renewable energy industry and the circular economy. As a result, it lacks insights into the effectiveness of current frameworks supporting women-led initiatives in this sector.

While this study touches on some of the general challenges faced by women in the renewable energy sector in Ghana, it does not delve deeply into specific barriers preventing women from entering or advancing within technical and leadership roles, particularly in Ghana.

Also, the study lacks an analysis of the economic impact that women-led renewable energy initiatives have on Ghana's energy sector. Without such data, the economic case for women inclusivity remains unexplored making a less compelling argument for gender-inclusive practices within the renewable energy sector.

Moreover, this study does not include case studies or examples of how women's involvement in Ghana's renewable energy has contributed to climate adaptation and resilience at the community level.

5.5 Suggestions for future studies

The study makes proposes the following discussion points for further research by other scholars.

Further studies must evaluate existing policies and funding mechanisms that support women entrepreneurs in renewable energy and circular economy to determine their effectiveness. By identifying successful frameworks and common shortcomings, future studies could inform the development of more inclusive and effective support initiatives for women-led enterprises.

Again, there is the need for a research to conduct a deeper investigation into specific barriers that prevent women from entering or advancing within technical and leadership positions in Ghana's renewable energy industry would provide actionable insights. Such a study could include barriers like access to education, biases in hiring practices, and workplace culture, offering a detailed understanding of challenges and potential solutions designed for the sector.

To add to, a further quantitative study on the economic impact of renewable energy initiatives led by women to the general energy sector would be relevant by focusing on indicators such as revenue growth, employment rates, and energy output in women-led enterprises, providing a

robust argument for gender inclusivity from an economic perspective and demonstrating tangible benefits of women's participation.

Also, future studies can focus on case studies or projects where women's involvement has enhanced community adaptation to climate change could provide concrete examples of how women inclusion and participation as well as climate resilience are interconnected, supporting policies that emphasize the role of women in climate action.

5.6 Recommendations of the Study

Based on the positive correlation among the tested variables, the study recommends the following interventions to reinforce women participation and inclusivity within the renewable energy sector in Ghana. These interventions aim to enhance each area, recognizing that improvements in one may have a positive spillover effect on the others.

One recommendation of this study is that the implementation of Gender-responsive policies must be strengthened. The government of Ghana must implement a robust framework to aid track and assess the impact of gender-responsive policies specifically within the renewable energy sector. Regularly evaluating how these policies contribute to increased inclusivity and empowerment for women will provide data for the adjustment of such approaches. Another way of strengthening gender-responsive policy implementation is by conducting targeted campaigns to increase awareness of gender-responsive policies within energy organizations and among policymakers. This is to ensure that these actors and stakeholders understand the importance of gender considerations for more effective policy outcomes. Again, offering recognition awards as well as financial incentives for organizations within the renewable energy sector that implement proven gender-responsive practices such as mentorship opportunities for women, scholarships for technical training, or quotas in leadership positions

is an effective way of increasing women participation and inclusivity in the renewable energy sector.

Also, support and funding for women entrepreneurs in Ghana's renewable energy sector must be enhanced. Establishing incubation or acceleration hubs as well as mentorship programs that connect women entrepreneurs with experienced leaders and experts in renewable energy, helping them build strong networks that can open up further funding and growth opportunities is one approach toward encouraging and increasing women participation and inclusivity in Ghana's renewable energy sector.

Further, developing and expanding funding programs tailored for women entrepreneurs within renewable energy industry would be useful. These could include grants, low-interest loans, or venture capital that focus on supporting women-led startups and small-to-medium enterprises.

Furthermore, integrating financial literacy and entrepreneurship training specifically designed for women into renewable energy funding programs. Skills such as budgeting, financial planning, and scaling business operations can empower more women to establish sustainable enterprises.

Moreover, the positive relationship between variables of this study indicates the association of women participation and climate resilience. Thus, the study recommends that there must be increased representation of women in technical and leadership roles in Ghana's renewable energy sector. This can be done by developing or expanding technical training programs for women in partnership with academic institutions, vocational schools, or renewable energy companies. Leadership development programs which include workshops on strategic decision-making, project management, and cross-cultural communication aimed at preparing women for decision-making roles within renewable energy must also be designed. Companies should be encourage to implement workplace inclusivity programs that create a supportive environment

for women in technical and leadership roles. This could include flexible working hours, anti-discrimination policies, and inclusive workspaces.

To add to, expanding community-based education programs on renewable energy led by women is another approach to increase women inclusivity and participation in Ghana's renewable energy sector. These programs will not only raise awareness but also build community support for women in the renewable energy field. Public awareness campaigns that highlight the contributions of women in renewable energy could also be launched. This would help emphasize women's success stories can inspire more participation and demonstrate the impact of gender inclusivity on sustainable energy practices. The renewable energy sector could partner with educational institutions to introduce renewable energy awareness programs that focus on the importance of gender equality in the field. This can help inspire younger generations and encourage more women to pursue studies and careers in renewable energy.

Also, programs that address both gender equality and climate resilience, recognizing that both factors impact each other must be designed. For example, programs that promote women's roles in community energy planning can improve both gender inclusivity and climate resilience outcomes.

Policymakers must allocate funding for initiatives that focus on the intersection of gender equality and climate resilience. This could include grants for community-based renewable projects that involve women's leadership.

These recommendations provide a holistic approach, leveraging the moderate correlations between gender-responsive policies, inclusivity, and empowerment. By reinforcing these areas through funding, training, policy support, and awareness campaigns, Ghana's renewable energy sector can create a more inclusive and effective environment for women.

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APPENDIX

QUESTIONNAIRE

WOMEN AND RENEWABLE ENERGY: ENSURING CLIMATE RESILIENCE IN GHANA THROUGH INCLUSIVE AND PARTICIPATORY PROCESSES

My name is Rhodaline Tetteh-Narh, a MA. Development Communication student at the Institute of Journalism, University of Media, Arts and Communication (UniMAC-GIJ), Ghana. I would like to know your opinion on the above subject. The study aims to investigate the role of women and renewable energy in ensuring climate resilience in Ghana. It will take you about 10 minutes to complete this questionnaire. All information provided will be kept anonymous so please be objective with your responses. Thank you for your assistance.

You can contact me on 0501651930 or madc23035@student.unimac.edu.gh

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SELF-ASSESSMENT INSTRUCTIONS:

1. Under each question, Part One-Four are a set of continua to rank the state of renewable energy in Ghana and how women are involved in the renewable energy sector, including some barriers they face from "STRONGLY DISAGREE – STRONGLY AGREE."
2. Please indicate below, your level of agreement with the following statements using a 5-point Likert scale as stated:

   1 = Strongly Disagree 2 = Disagree

   3 = Neutral 4 = Agree 5 = Strongly Agree

PART ONE

Current State of Renewable Energy in Ghana					
Statement	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
Renewable energy sources are widely available in Ghana					
The government of Ghana is effectively promoting renewable energy initiatives					
There is sufficient investment in renewable energy infrastructure in Ghana					
Ghana's current energy policy strongly supports the transition to renewable energy					
The adoption of renewable energy in Ghana is progressing at a satisfactory rate					
Renewable energy is increasingly becoming more affordable and accessible in Ghana					
Public awareness and education on renewable energy are well promoted in Ghana					

The private sector is actively involved in the development of renewable energy in Ghana					

PART TWO:

Role of Women in the Renewable Energy Transition in Ghana					
Statement	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
Women play a significant role in decision-making processes related to renewable energy					
Women's perspectives are considered in renewable energy policy-making					
There are visible female leaders in Ghana's renewable energy sector					
Women have equitable access to opportunities in the renewable energy industry					
Training and capacity-building programs in renewable energy adequately include women					
Women are well-represented in technical roles within the renewable energy sector					

Policies are in place to support the involvement of women in renewable energy initiatives					
There is strong advocacy for increasing women's participation in the renewable energy transition					

PART THREE:

Barriers to Women's Inclusivity and Participation in the Renewable Energy Sector					
Statement	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
Cultural norms limit women's participation in the renewable energy sector					
Women face significant discrimination when entering the renewable energy industry					
Limited access to education and training restricts women's involvement in renewable energy industry					
Less access to networks and mentorship programmes discourages					

women from pursuing careers in renewable energy.					
Financial constraint is a major hinderance for women in the renewable energy sector					

PART FOUR:

Effective Inclusive and Participatory Processes					
Statement	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
Gender-responsive policies significantly Impact climate resilience efforts					
Women inclusivity in community-based renewable energy project planning results in more sustainable outcomes.					
Women-led education programmes effectively increase public awareness of renewable energy.					

Training and mentorships programmes encourage women to pursue careers in renewable energy.					
Funding programmes for women entrepreneurs increases renewable energy initiatives.					

PART FIVE:

Climate Resilience and Women's Participation					
Statement	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
Increased women's participation in renewable energy initiatives improves community adaptation to climate change					
Gender-balance in renewable energy decision making leads to more effective climate resilience strategies					
Women-led households are more likely to adopt climate-resilient energy practices					

Women's traditional knowledge contributes to climate-resilient energy policies and solutions					
Empowering women in the renewable energy sector strengthens overall community resilience to climate change					